United States Department of Energy

Savannah River Site

Scoping Summary for the ABRP/MCB/MBP Operable Unit (U)

WSRC-RP-2000-4095

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SRS

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1.0 PROJECT PHASE AND STATUS

The A-Area Burning/Rubble Pits (731-A, -1A) and Rubble Pit (731-2A) (ABRP) and Miscellaneous Chemical Basin/Metals Burning Pit (731-4A, -5A) (MCB/MBP) Operable Units (OU) have been combined into a single OU, which includes the A-Area Ash Pile (788-2A). The final actions for surface soils, vadose zone and groundwater for the OUs will be documented in a single final ABRP/MCB/MBP OU Record of Decision (ROD). A Rev. 1 Corrective Measures Study/Feasibility Study (CMS/FS) for the consolidated ABRP/MCB/MBP OU was submitted in March 2005. Regulatory comments were received in May 2005.

Interim and final actions are ongoing or have been completed at the ABRP and MCB/MBP surface units, vadose zone and groundwater. A summary of the interim and final actions is provided in Table 1.

This Scoping Summary supports the development of a Statement of Basis/ Proposed Plan (SB/PP) for the final remedies for the ABRP/MCB/MBP OU.

2.0 BACKGROUND

The ABRP/MCB/MBP OU is located approximately 2.4 km (1.5 mi) south of M Area, west of Road D and northeast of Road C, and 4.8 km (3 mi) east of the Savannah River Site (SRS) boundary (see Figure 1). The OU is located in the Upper Three Runs watershed and is situated in a mix of flat, grassy and wooded terrain.

2.1 ABRP

Facility documentation indicated that the two Burning/Rubble Pits (BRPs) (731-A, -1A) were first constructed in 1951. Other potential sources of contamination identified as part of the area include a Rubble Pit (731-2A), Potential Pit, Depressional Area, Trench, Ditch, and Ash Scatter Area (see Figure 1). Specific disposal records are not known to exist for these subunits; however, SRS rubble pits were generally used to dispose of construction debris, waste wood products, and non-returnable empty drums. The pits were not used after 1983 and the pits were covered with soil to grade level.

The A-Area Ash Pile (788-2A), used for the disposal of ash from the A-Area powerhouse prior to 1994, covers over 2 acres and is about 20 feet thick. The A-Area Ash Pile is located between the Pits Area and the Ash Scatter Area/Ditch subunits. The Trench subunit extends beneath the Ash Pile.

2.2 MCB/MBP

The MCB received liquid chemical wastes and is located in an old borrow pit. No construction records exist for the borrow pit. No records of specific materials disposed were kept, although its presumed use was for the disposal of solvent and used oil.

The MBP was a cleared area that was used for burning lithium-aluminum alloys, scrap, and cuttings from A&M Area operations. Unit photographs show what is thought to be typical disposal of metal shavings, pieces of aluminum, plastic pipe, metal drums, and other miscellaneous scrap. The site was reportedly placed into service in 1960 and taken out of service in 1974. At that time, the waste piles were regraded and the area was allowed to revegetate with natural flora.

3.0 LAND USE

The Rev. 1.1 Interim Corrective Measures Implementation / Remedial Action Implementation Plans (ICMI/RAIP) for ABRP and MCB/MBP include institutional controls with the specific exclusion of residential land use due to the presence of soil covers. Therefore, industrial land use appears as the most likely future land use scenario.

4.0 SUBUNITS

The ABRP/MCB/MBP OU is composed of the following subunits (see Figure 1):

- 731-A-Burning/Rubble Pit;
- 731-1A-Burning/Rubble Pit;
- Potential Pit;
- Depressional Area;
- Ash Scatter Area / Ditch;
- 731-2A Rubble Pit;
- A-Area Ash Pile
- Trench (including vadose zone soils);
- MCB Surface Soil
- MCB Vadose Zone
- MBP Surface Soil
- Groundwater in the M-Area Aquifer Zone (MAAZ);
- Groundwater in the Lost Lake Aquifer Zone (LLAZ).

4.1 Burning/Rubble Pits (731-A, -1A), Potential Pit, Depressional Area, and Ash Scatter Area/Ditch Subunits

Problem Warranting Action

No refined human health, ecological, or contaminant migration contaminants of concern (COCs) have been identified at the BRPs, Potential Pit, Depressional Area or Ash Scatter/Ditch. Thus, there is no problem warranting action for these subunits.

Uncertainty

None.

4.2 Rubble Pit (731-2A) Subunit

The Rubble Pit (731-2A) is approximately 800 feet long by 100 feet wide. Benzo(a)pyrene in surface soil was identified as a refined COC for the industrial worker, at concentrations exceeding the remedial goal (RG) of 0.2 mg/kg. The final action selected for Rubble Pit 731-2A surface soils in the ABRP Interim Record of Decision (IROD) consisted of a minimum one-foot thick soil cover combined with institutional controls. Construction of the soil cover, which also covered the BRPs (731-A,-1A), was completed September 2001. This action remains protective of human health.

Problem Warranting Action

No further problems warranting action exist at Rubble Pit 731-2A.

Uncertainty

None.

4.3 A-Area Ash Pile

Problem Warranting Action

- Arsenic (4.3×10^{-5}) and coal related radionuclides (2.2×10^{-4}) are present at concentrations in the 0 to 1 ft interval that exceed 10^{-6} risk for the future industrial worker.

- Arsenic and selenium are present at concentrations in the 0 to 1 ft and 0 to 4 ft intervals that are predictive of a potential ecological hazard (LOAEL HQs > 1).

Remedial Action Objectives

- Prevent human exposure to COCs that present a risk to future industrial workers.

- Prevent ecological exposure to COCs that present a hazard to ecological receptors.

Scope of Problem Warranting Action

The A-Area Ash Pile covers approximately 2.5 acres (275 feet × 400 feet). The Ash Pile is approximately 14 to 24 feet higher than the surrounding topography. Based on an average thickness of 20 feet, the total volume of the ash is approximately 79,000 cubic yards.

Likely Response Action

The proposed response action is a soil cover with institutional controls to prevent human and ecological exposure. This alternative is recommended because ***it is*** protective of human health or the environment. Excavation and disposal alternatives were not feasible.

Uncertainty

None.

4.4 Trench Subunit (including Vadose Zone Soil)

The Trench is approximately 15 feet wide by 300 feet long, most of which is overlain by about 20 feet of compacted ash (see Figure 1). The Trench is between 8 and 15 feet deep, and approximately 5-10% of the Trench is exposed, south of the Ash Pile.

The vadose zone in the vicinity of the ABRP is about 130 ft thick. The upper 80 feet is made up of sands and silt, underlain by a 6 – 8 ft layer of predominantly clay that sits atop another sand/silt layer that is approximately 40 ft thick. A perched water zone is present at times just above the clay-rich zone.

The ABRP IROD was supplemented by an Explanation of Significant Difference that added an interim action of low-energy soil vapor extraction (SVE) to address trichloroethene (TCE) contamination in the vadose zone beneath the trench. Three SVE wells are currently in operation as microblowers and one as a passive well as part of this on-going interim action.

Problem Warranting Action

There is principal threat source material (PTSM) at the base of the trench. The maximum detection of TCE was 487 mg/kg. TCE concentrations are also present at levels in the vadose zone that would migrate to groundwater above the maximum contaminant level (MCL) of 5.0 µg/L in less then ten years.

Remedial Action Objectives

- Treat or remove the TCE (PTSM) to the extent practicable.
- Prevent migration of TCE contamination in soil to groundwater at a concentration above its MCL (TCE = 5.0 µg/L). The contaminant migration remedial goal objective (CMRGO) for the soil is 0.61 mg/kg TCE.

Scope of Problem Warranting Action

The estimated volume of the high concentration source term at the base of the trench in the immediate vicinity of AHT-03 is up to 16,240 cubic feet.

An estimate of the volume of the contaminated vadose zone above the CMRGO is about 367,200 cubic feet, with a maximum areal extent of 360 feet (east-west extent) X 85 feet (north-south extent). Figure 2 shows the plan view extent of contamination above the CMRGO and the approximate location of additional proposed SVE wells.

Likely Response Actions

Removal of TCE from the vadose zone using phased SVE technologies, including a portable SVE unit, solar powered MicroBlowers, and passive barometric pumping, with institutional controls.

Uncertainty

None.

4.5 MCB Surface Soil Subunit

Polychlorinated biphenyls (PCBs) were present in soils exceeding both the human health RG (1 mg/kg) and the ecological RG (0.215 mg/kg). Octachlorodibenzo-p-dioxin (OCDD) was also present as a human health COC. The final action selected for MCB surface soils in the MCB IROD was excavation of PCB contaminated soils, to a maximum depth of 4 feet, combined with institutional controls. The excavation, which included an area of about 95,000 sq. ft (over 2 acres), was completed in February 2002. Confirmatory sampling was performed to verify that remedial goals were met. The excavation was backfilled with clean soil. This action remains protective of human health.

Problem Warranting Action

No further problems warranting action exist at the MCB surface soil subunit.

Uncertainty

None.

4.6 MCB Vadose Zone Subunit

The vadose zone is approximately 120 ft thick. The vadose zone contains a clay-rich zone up to 15 feet below ground surface (bgs), underlain by 60-70 feet of sands/silts, a 10 ft thick clay lens at a depth of 75 – 85 ft, and sands and silts to the water table.

Tetrachloroeythlene (PCE) and TCE contamination was found in the vadose zone at levels that would migrate to groundwater at a concentration above the MCL of 5.0 μg/L in less than 10 years. The final action selected for the MCB vadose zone in the MCB IROD was Active/Passive SVE, with a CMRGO of 0.344 mg/kg for both PCE and TCE. Twenty-five SVE wells were installed covering an area of about 93,200 square feet (over 2 acres). Active SVE operation has been completed and passive SVE is ongoing. Effectiveness monitoring indicates declining contaminant concentrations consistent with effective removal of contaminated soil gas.

Problem Warranting Action

Residual TCE and PCE contamination remains above the RG of 0.344 mg/kg at depths of 0 – 15 ft bgs.

Remedial Action Objectives

Prevent migration of VOC contamination in soil to groundwater at a concentration above its MCL (TCE and PCE = 5.0 μg/l).

Scope of Problem Warranting Action

Vadose zone soil gas contamination (above 0.1 ppmv) covers an area of approximately 30,000 square feet.

Likely Response Actions

Passive SVE is ongoing as per the MCB/MBP IROD, with fourteen wells currently venting. No further response action is required.

Uncertainty

None.

4.7 MBP Surface Soil Subunit

Aluminum concentrations exceed the ecological RG of 11,000 mg/kg at two areas totaling approximately 19,000 square feet to a maximum depth of 4 feet. The final action selected for MBP surface soils in the MCB/MBP IROD is excavation of contaminated soils to a maximum depth of 4 feet. Excavation was completed February 2002. Confirmatory sampling was performed to verify that remedial goals were met. The excavation was backfilled with clean soil.

Problem Warranting Action

No further problems warranting action exist at the MBP surface soil subunit.

Uncertainty

None.

4.8 M-Area Aquifer Zone (MAAZ) Groundwater Subunit

The water table aquifer or MAAZ is present in a thin zone of silty sands above the green clay confining zone (GCCZ). The GCCZ consist of three layers in the vicinity, an 8 – 10 ft thick silty clay layer (the upper clay), an

8 – 10 ft thick layer of silty sand, and an approximately 2 ft thick silty clay (the lower clay).

Problem Warranting Action

Groundwater in the MAAZ contains levels of TCE, PCE and cis-1,2-dichloroethylene (DCE) exceeding MCLs (5 μg/L for TCE and PCE, 70 μg/L for cis-1,2 DCE).

Remedial Action Objectives

- Prevent human exposure to contaminated groundwater above MCLs.
- Prevent discharge of contaminants to lower aquifers.
- Reduce contaminant concentrations in groundwater to below MCLs.

Scope of Problem Warranting Action

The volume of impacted groundwater (above MCLs) associated with the ABRP/MCB MAAZ plumes are approximately 10 million cubic feet. Figure 3 shows the 2004 TCE plume in the MAAZ (solid line) and the plume used in the FS for alternative analysis (dashed line). Plume movement is to the west at ABRP and northwest at MCB with a strong downward vertical component.

Likely Response Actions

Table 2 (same table as ES-4 in CMS/FS) shows the simplified subjective comparative analysis for the groundwater alternatives, which includes both the MAAZ and the LLAZ. The project teams' top three alternatives overall for both aquifers are highlighted in Table 2. Table 3 shows the time to achieve treatment targets and mass treated for each alternative. Figure 5 shows the 500 μg/L and 100 μg/L treatment lines used in the CMS/FS for the MAAZ.

- Monitored Natural Attenuation (MNA) with Institutional Controls – The Core Team agreed that this was the preferred alternative for the MAAZ, based on the modeling results that indicate that the most aggressive treatment (to 100 μg/L) only reduces the time to reach MCLs by 10 years and reduces contaminant mass by about 30 kg, as shown on Figure 4.

Uncertainty

It is not known whether 1,4-dioxane is a groundwater COC (present above 6.1 µg/L, the tap water PRG). This impacts the problem warranting action (potential new COC). As part of 3Q2005 groundwater program, sampling and analysis for 1,4-dioxane will be conducted to determine if 1,4-dioxane is present above levels of concern.

4.9 Lost Lake Aquifer Zone (LLAZ) Groundwater Subunit

The LLAZ, which lies directly under the GCCZ, varies from 60 feet to 100 feet thick and overlies the Crouch Branch Confining Unit (CBCU).

Contamination from ABRP, MCB and upgradient M-Area sources are present in the LLAZ. These plumes appear to commingle south of ABRP. Figure 6 shows the composite LLAZ TCE plume, including A/M-Area sources. Contamination from upgradient M-Area sources is also present underlying the LLAZ, in the middle sand zone of the CBCU, and in the Crouch Branch Aquifer (CBA).

Problem Warranting Action

Groundwater in the LLAZ contains levels of TCE, PCE and cis-1,2 (DCE) exceeding MCLs (5 µg/L for TCE and PCE, 70 µg/L for cis-1,2 DCE).

Remedial Action Objectives

- Prevent human exposure to contaminated groundwater above MCLs.
- Reduce contaminant concentrations in groundwater to below MCLs.
- Prevent the discharge of contaminated groundwater to surface waters and lower aquifers (Crouch Branch) above MCLs.

Scope of Problem Warranting Action

The volume of impacted groundwater (above MCLs) associated with ABRP/MCB LLAZ plumes is calculated to be approximately 105 million cubic feet. Figure 7 shows the 2004 TCE plume in the LLAZ (solid line) and the plume used in the FS for alternative analysis (dashed line).

Likely Response Actions

Table 2 (same table as ES-4 in CMS/FS) shows the simplified subjective comparative analysis for the groundwater alternatives, which includes both the MAAZ and the LLAZ. The project teams' top three alternatives overall for both aquifers are highlighted in Table 2. Table 3 shows the time to achieve treatment targets and mass treated for each alternative. Figure 8 shows the 500 μg/L and 100 μg/L treatment lines used in the CMS/FS for the LLAZ.

- Monitored Natural Attenuation with Institutional Controls – The Core Team agreed that this was the preferred alternative for the LLAZ, based on the CERCLA balancing criteria. The modeling results that indicate that the most aggressive treatment (to 100 μg/L) reduces the time to reach MCLs by over 50 years. About 160 kg of additional contaminant mass is also treated in the LLAZ (see Figure 4). The additional cost is for this treatment over MNA is about $6.4 M (present worth). No impact to surface water and minimal impact to the CBA is predicted with MNA only.

Uncertainty

- VOC contaminants associated with M-Area sources have been detected both up-gradient and down-gradient of the ABRP in the LLAZ and lower aquifers. The amount of commingling of M-Area sourced contamination with ABRP/MCB sources is uncertain. This may effect the predicted duration of treatment and the ability to validate the model with empirical data to support MNA. This will be addressed by a groundwater monitoring strategy to be established as part of the CMI/RAIP.

- It is not known whether 1,4-dioxane is a groundwater COC (present above 6.1 μg/L, the tap water PRG). This impacts the problem warranting action (potential new COC). As part of 3Q2005 groundwater program, sampling and analysis for 1,4-dioxane will be conducted to determine if 1,4-dioxane is present above levels of concern.

5.0 OPERABLE UNIT STRATEGY

The Core Team agreed to the final remedial response actions for the ABRP/MCB/MBP OU subunits as shown in Table 1. Those actions remaining to be implemented are highlighted.

Although the time to achieve MCLs in the LLAZ by MNA is predicted to be long (about 155 years), the extent and magnitude of LLAZ impact by ABRP/MCB sources is minor in comparison to other upgradient M-Area sources. Despite current RCRA corrective action systems that are operating to reduce this contamination under the M-Area Hazardous Waste Management Facility Permit, the LLAZ will remain contaminated above MCLs for over 100 years. Thus, any active remediation taken to address the portion of the LLAZ impacted from ABRP/MCB sources will not improve the overall quality of the LLAZ, as upgradient contamination moves downgradient into the vicinity of ABRP/MCB.

The SB/PP will include transition criteria for the phasing of SVE from active to passive operation.

The project team proposes to suspend operation of recirculation wells, based on Core Team acceptance of MNA as the preferred alternative for groundwater. A letter justifying this proposal will be provided to the Core Team.

The following schedule remains for the ABRP/MCB/MBP OU regulatory decision documents.

- Submit SB/PP Rev. 0 – August 11, 2005
- Receipt of USEPA/SCDHEC Approval – November 24, 2005
- Submit ROD Rev. 0 – February 6, 2006
- Receipt of ROD Approval – May 23, 2006

Key Changes Table

Sections	Description of Change	Rationale for Change
4.0	Text revised to reflect completion of CMS/FS, with emphasis on providing information to help Core Team select the best response action.	Reflects the current project status, scoping the proposed plan.
4.3, 4.4, 4.6, 4.8, 4.9	Uncertainties eliminated.	Based on data collected, decisions made by the Core Team, or analysis conducted in the CMS/FS.
5.0	Revised Operable Unit Strategy	Updated to reflect the incorporation of proposed final response actions for the ABRP/MCB/MBP OU and points discussed at the June 14, 2005 SB/PP Scoping Meeting.
Tables	New Tables 2 and 3 added.	Updated to reflect the analysis of alternatives completed in CMS/FS.
4.3	A-Area Ash Pile Uncertainty changed to None.	The A-Area Ash Pile is permitted as an Industrial Wastewater Facility. Per agreement with the SCDHEC Bureau of Water, the closure of this facility under the CERCLA program is considered as an acceptable closure substitute for closure under SCDHEC Regulation 61-82. In addition, the Industrial Wastewater Permit and the regulations will be considered as ARARs under the CERCLA program.

Significant Core Team Agreements

Agreement	Meeting
The A-Area Ash Pile will not be included as a sub-unit for the ABRP OU.	Post Characterization Scoping Meeting, December 2001
Stage 2 of the interim remedial action for VOC contamination in the M Area aquifer zone was deleted and an evaluation of a comprehensive range of alternatives for the final remedy will be performed in the CMS/FS. The deletion of Stage 2 will be documented in the Final ROD.	Problem Identification Scoping Meeting, June 2002
The strategy for incorporation of the Lost Lake aquifer contamination will be discussed at the CMS/FS scoping meeting scheduled to be held in August of 2003.	Problem Identification Scoping Meeting, June 2002
Consolidate the ABRP and MCB OUs because both units have similar contaminants, impact the same aquifers and have overlapping plumes.	Performance Evaluation Report Comment Resolution/Operable Unit Strategy Meeting, March 2003
Although a mixing zone application was not an appropriate administrative alternative, monitored natural attenuation is a viable response action.	CMS/FS Scoping Meeting, August 2003
During refinement of the extent of vadose zone contamination above RGs in the trench area, additional SVE wells could be installed without an ESD to the IROD being required.	CMS/FS Scoping Meeting, August 2003
The Core Team agreed to an evaluation of active treatment alternatives to target concentrations of 500 µg/L and 100 µg/L, with MNA addressing the residual portion of the plume greater than MCLs.	CMS/FS Scoping Meeting, August 2003
The final actions completed or ongoing (SVE at MCB) as identified in the IRODs for ABRP and MCB/MBP are adequate and additional response actions do not need to be evaluated in the CMS/FS.	CMS/FS Scoping Meeting, August 2003
The Core Team agreed that an evaluation of response actions addressing lead in the CMS/FS is not required.	CMS/FS Scoping Meeting, August 2003
The A-Area Ash Pile will be included as a subunit for the ABRP/MCB/MBP.	Letter from USDOE (Brian T. Hennessey) to USEPA (D.C. Taylor) and SCDHEC (C.M. Gorman), November 12, 2004
The Core Team agreed that the nature and extent of the A-Area Ash Pile has been defined and that no additional sampling is necessary.	A-Area Ash Pile Scoping Meeting, December 8, 2004
The Core Team agreed that the following alternatives should be developed and screened in Chapter 3 of the revised CMS/FS: No Action; Excavation and off-SRS Disposal; Excavation and on-SRS Disposal; and Soil Cover. Each alternative would include institutional controls.	A-Area Ash Pile Scoping Meeting, December 8, 2004
The Core Team agreed that excavation and disposal alternatives should not be carried forward into the Detailed Analysis of Alternatives (Chapter 4) of the revised CMS/FS. Rather, a detailed discussion of the effectiveness, implementability, and cost will be provided in the Development and Screening of Alternatives (Chapter 3). The analysis will include a discussion that the removal of the ash will expose the underlying Trench,	A-Area Ash Pile Scoping Meeting, December 8, 2004

thereby creating an unacceptable human and ecological exposure scenario due to the presence of polynuclear aromatic hydrocarbons (i.e., benzo(a)pyrene).	
The Core Team agreed that an appendix will be provided in the revised CMS/FS that includes a streamlined RFI/RI/BRA report for the A-Area Ash Pile. The streamlined report will include a conceptual site model; a discussion of nature and extent of contamination; a contaminant migration analysis; human health and ecological risk evaluations; and an ARAR and PTSM evaluation. The nature and extent discussion will include maps for arsenic, selenium, and radium-226, as these are the primary risk drivers and are key indicators of ash. The nature and extent discussion will also include an examination of coal-related radionuclides. The contaminant migration analysis and risk evaluations will be streamlined from the current templates to include a discussion of the screening steps, results, and uncertainty. The appendix will be summarized in Chapter 1 of the revised CMS/FS.	A-Area Ash Pile Scoping Meeting, December 8, 2004
The Core Team agreed to the proposed remedies as presented in the SB/PP Scoping Summary, but requested language in the SB/PP explaining that the long time to reach MCLs in the LLAZ by MNA is acceptable, since it is within the remediation time frame for the upgradient plumes.	SB/PP Scoping Meeting, June 14, 2005

Table 1. ABRP/MCB/MBP Subunit Remedial Status

Area	Subunit	Status	Comments/Response Action
ABRP	Burning/Rubble Pits (731-A, -1A)	No Action Required	No COCs were identified. Although no action was required, the soil cover over 731-2A was extended to include this area.
	Potential Pit	No Action Required	No COCs were identified.
	Depressional Area	No Action Required	No COCs were identified.
	Ash Scatter Area/Ditch	No Action Required	No COCs were identified.
	A-Area Ash Pile	Final Action Required	Human health and eco COCs were identified. Recommended final response action is a soil cover.
	Rubble Pit (731-2A)	Final Action Complete	A soil cover to address benzo(a)pyrene surface contamination has been completed. Institutional controls have been implemented.
	Trench (including vadose zone soil)	Interim Action Ongoing, Final Action Required	Low energy SVE wells are in operation to address vadose zone VOC contamination. Recommended expansion of SVE.
MCB	Surface Soil	Final Action Complete	Excavation of PCB contaminated soil has been completed. Institutional controls have been implemented.
	Vadose Zone	Final Action Ongoing	Active SVE to address VOC contamination has been completed. Passive SVE is in progress and will be final remedy.
MBP	Surface Soil	Final Action Complete	Soil excavation to address aluminum contamination has been completed.
ABRP/MCB/MBP	M-Area Aquifer Zone	Interim Action Suspended, Final Action Required	Air sparging to address VOC contamination at ABRP proved ineffective therefore operations were suspended. Recommended final response action is MNA.
	Lost Lake Aquifer Zone	Interim Action Ongoing, Final Action Required	Groundwater recirculation well network to address VOC contamination is in operation downgradient of MCB. The interim action at ABRP did not include the LLAZ. Recommended final response action is MNA.

Table 2. Simplified Comparative Analysis for ABRP Groundwater Alternatives

Alternative	Overall Protection of Human Health & Environment	Compliance with ARARS	Long-Term Effectiveness & Permanence	Reduction of Toxicity, Mobility, or Volume thru Treatment	Short-Term Effectiveness	Implementability	Cost
GW-1 – No Action	No	Unk	1	1	3	5	$0
GW-2 – MNA w/ Institutional Controls	Yes	Yes	2	1	3	5	$4.8M
GW-3a – Recirculation Wells in LLAZ to 100 µg/L, MNA in MAAZ	Yes	Yes	4	4	3	3	$11.2M
GW-3b – PRB in LLAZ to 100 µg/L, MNA in MAAZ	Yes	Yes	4	4	3	2	$45.1M
GW-3c - Chemical Oxidation in LLAZ to 100 µg/L, MNA in MAAZ	Yes	Yes	4	4	3	3	$11.4M
GW-4a – Recirculation Wells in LLAZ to 500 µg/L, MNA in MAAZ	Yes	Yes	2	3	3	3	$6.0M
GW-4c – Chemical Oxidation in LLAZ to 500 µg/L, MNA in MAAZ	Yes	Yes	2	4	3	2	$6.4M
GW-5a – Recirculation Wells in MAAZ to 500 µg/L, MNA in LLAZ	Yes	Yes	2	2	4	3	$5.5M
GW-6a – Recirculation Wells in MAAZ to 100 µg/L, Recirculation Wells in LLAZ to 100 µg/L	Yes	Yes	5	5	5	3	$14.0M
GW-6b – Recirculation Wells in MAAZ to 100 µg/L, PRB in LLAZ to 100 µg/L	Yes	Yes	5	5	5	2	$48.3M
GW-6c – Recirculation Wells in MAAZ to 100 µg/L, Chemical Oxidation in LLAZ to 100 µg/L	Yes	Yes	5	5	5	2	$14.1M
GW-7a – Recirculation Wells in MAAZ to 500 µg/L, Recirculation Wells in LLAZ to 100 µg/L	Yes	Yes	5	4	4	3	$12.0M
GW-7b – Recirculation Wells in MAAZ to 500 µg/L, PRB in LLAZ to 100 µg/L	Yes	Yes	5	5	4	2	$45.4M
GW-7c – Recirculation Wells in MAAZ to 500 µg/L, Chemical Oxidation in LLAZ to 100 µg/L	Yes	Yes	5	4	4	3	$12.2M
GW-8a – Recirculation Wells in MAAZ to 500 µg/L, Recirculation Wells in LLAZ to 500 µg/L	Yes	Yes	2	3	4	3	$6.9M
GW-8b – Recirculation Wells in MAAZ to 500 µg/L, Chemical Oxidation in LLAZ to 500 µg/L	Yes	Yes	2	4	4	2	$7.5M

Table 3. Time to Achieve Active Treatment Targets and Mass Removed

			Time to Achieve <500 µg/L		Time to Achieve <100 µg/L		Time to Achieve <5 µg/L		Mass Treated (kg)
Alternative	MAAZ	LLAZ	MAAZ	LLAZ	MAAZ	LLAZ	MAAZ	LLAZ	
GW-2	No Treatment	No Treatment	12 years	2 years	28 years	17 years	70 years	155 years	0
GW-3a, GW-3b, GW-3c	No Treatment	Treatment to 100 µg/L	12 years	2 years	28 years	17 years	65 years	50 years	156
GW-4a, GW-4c	No Treatment	Treatment to 500 µg/L	12 years	2 years	28 years	17 years	70 years	155 years	36
GW-6a, GW-6b, GW-6c	Treatment to 100 µg/L	Treatment to 100 µg/L	11 years	2 years	23 years	14 years	60 years	46 years	189
GW-5a	Treatment to 500 µg/L	No Treatment	11 years	2 years	23 years	17 years	60 years	155 years	11
GW-7a, GW-7b, GW-7c	Treatment to 500 µg/L	Treatment to 100 µg/L	11 years	2 years	23 years	17 years	60 years	50 years	160
GW-8a, GW-8b	Treatment to 500 µg/L	Treatment to 500 µg/L	11 years	2 years	23 years	17 years	60 years	155 years	45

Figures

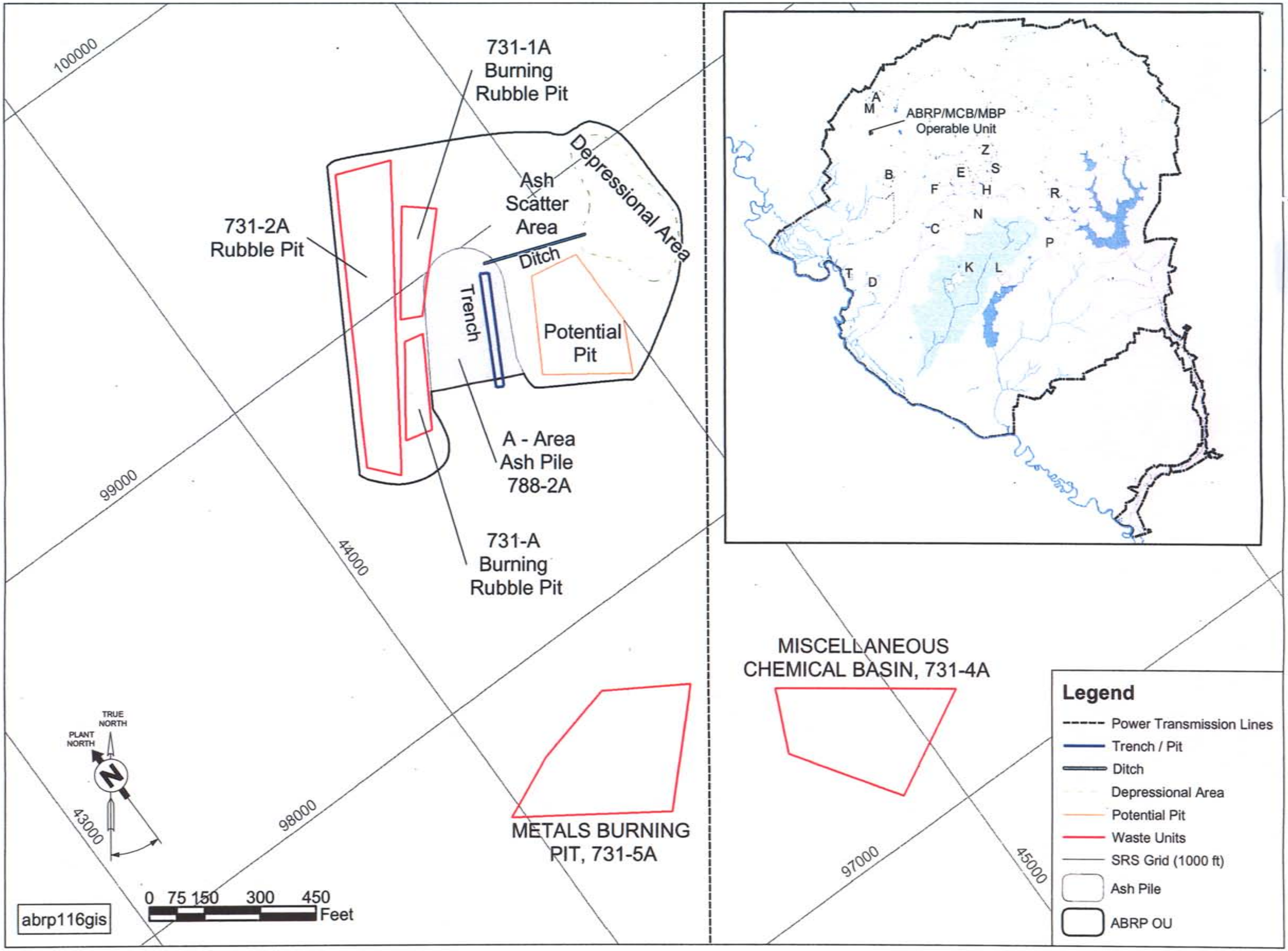

Figure 1 - ABRP/MCB/MBP OU Overview

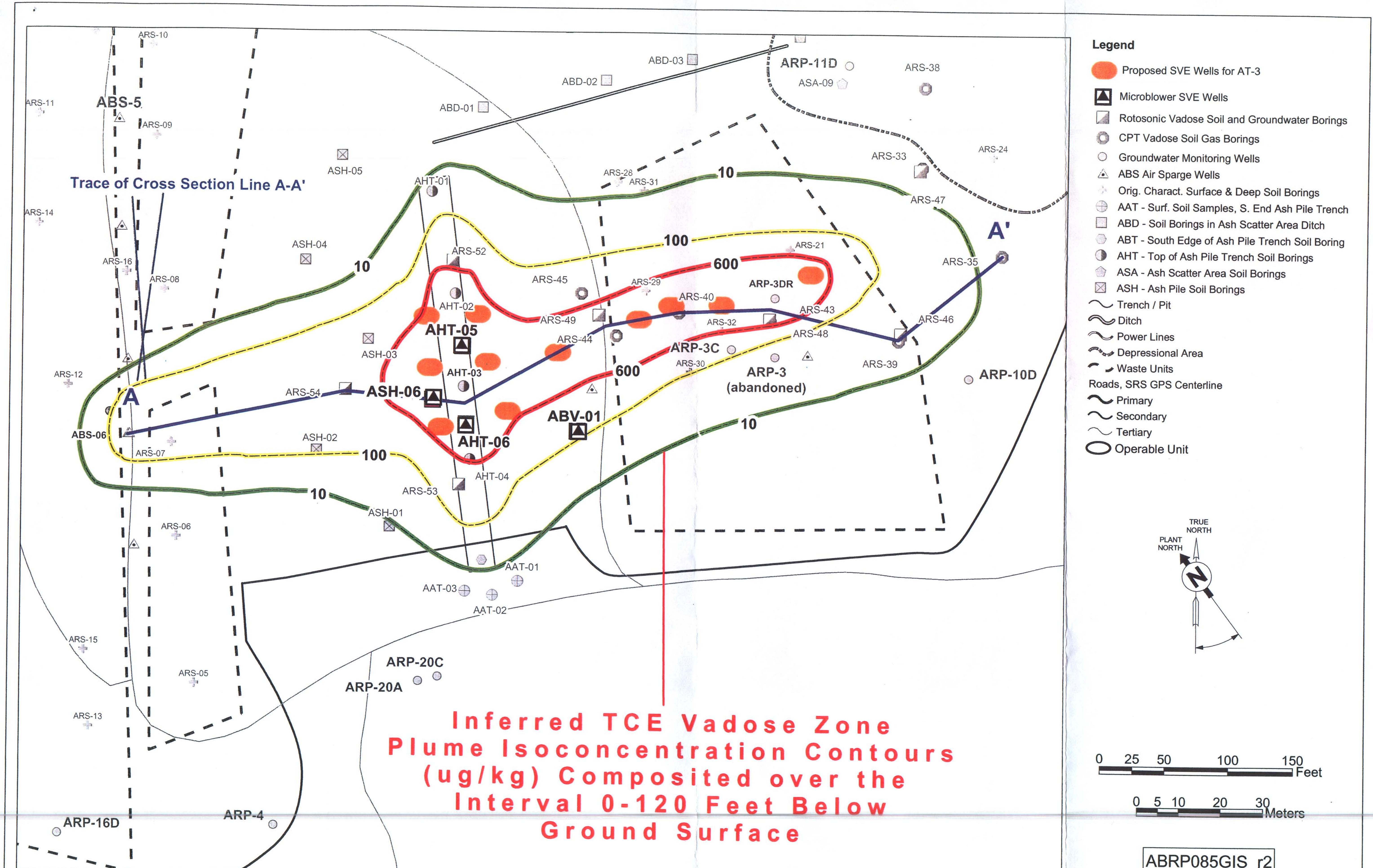

Figure 2 - TCE Contamination in Vadose Zone above CMRG with Additional SVE Wells

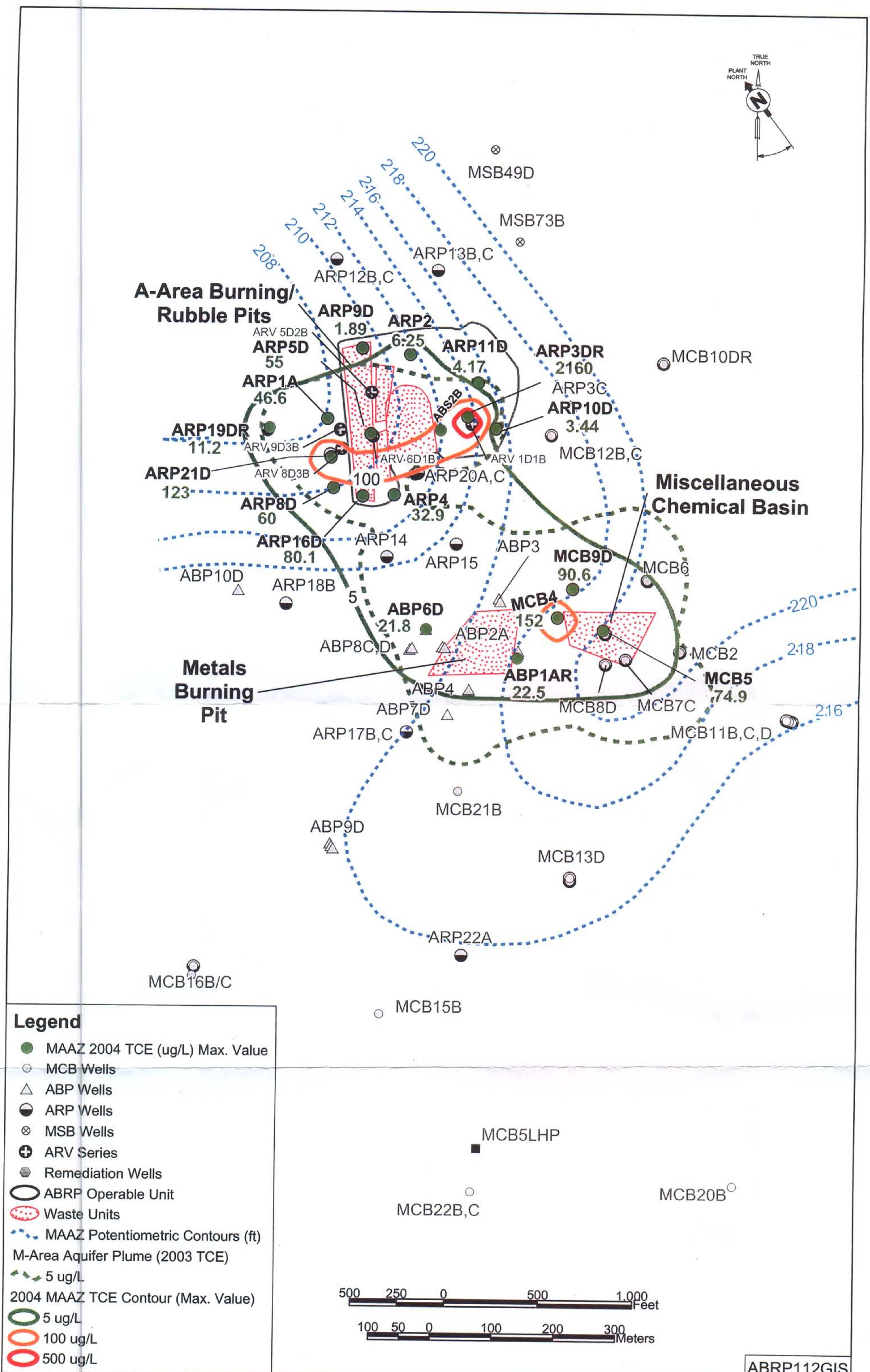

Figure 3 - 2004 TCE Plume in MAAZ

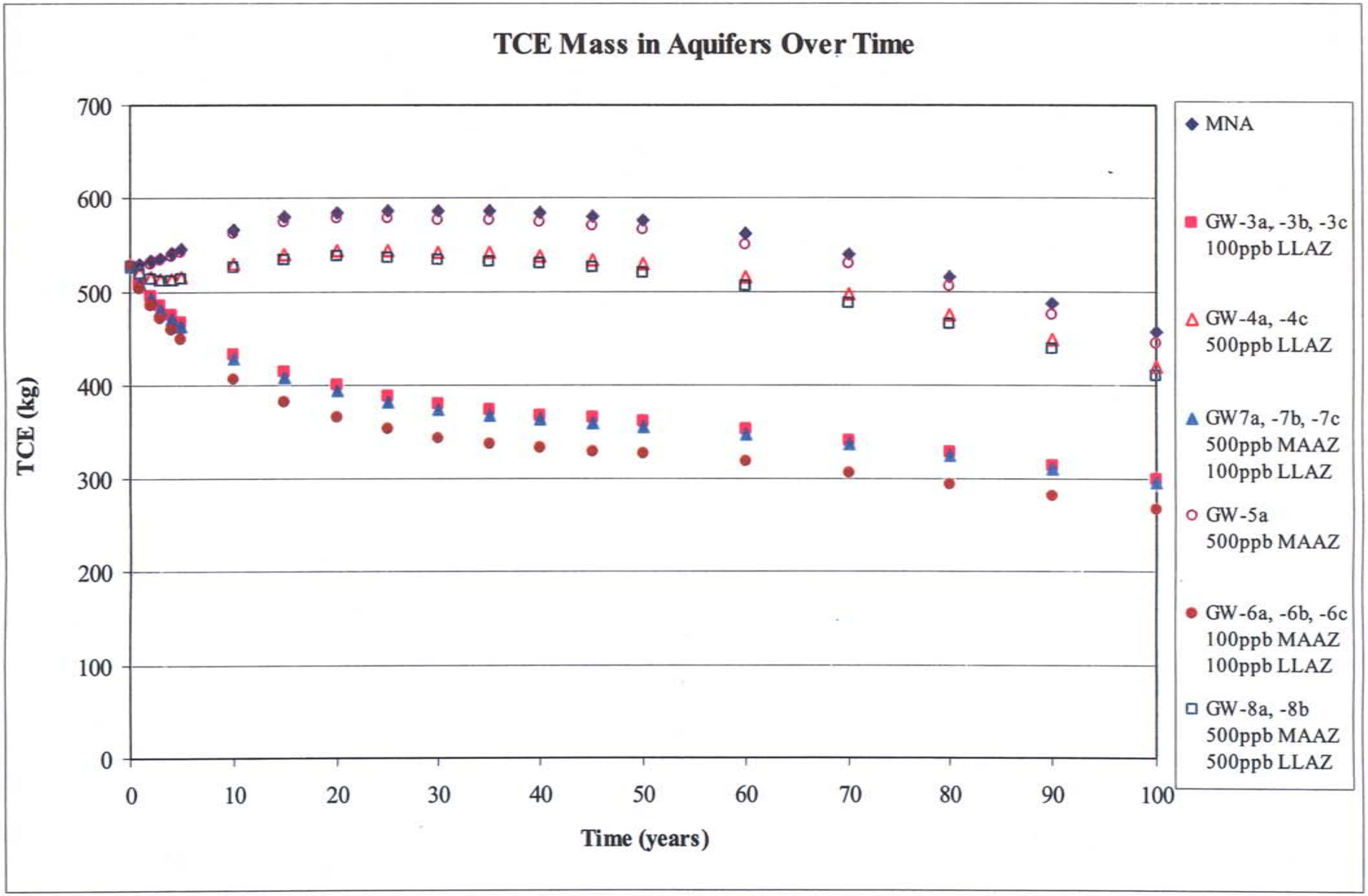

Figure 4 – TCE Mass in Aquifers Over Time

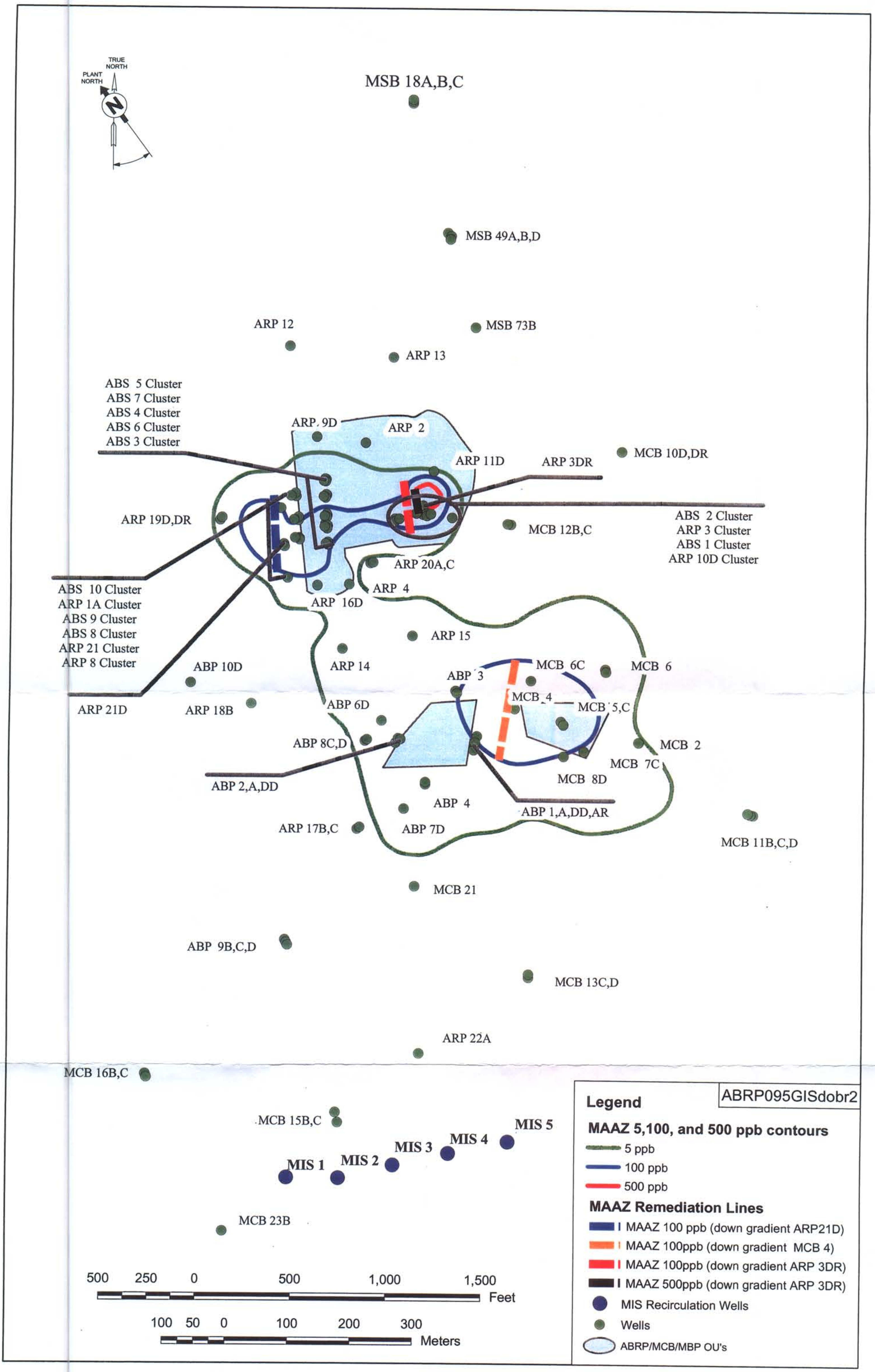

Figure 5 - MAAZ Remediation Lines Evaluated in CMS/FS

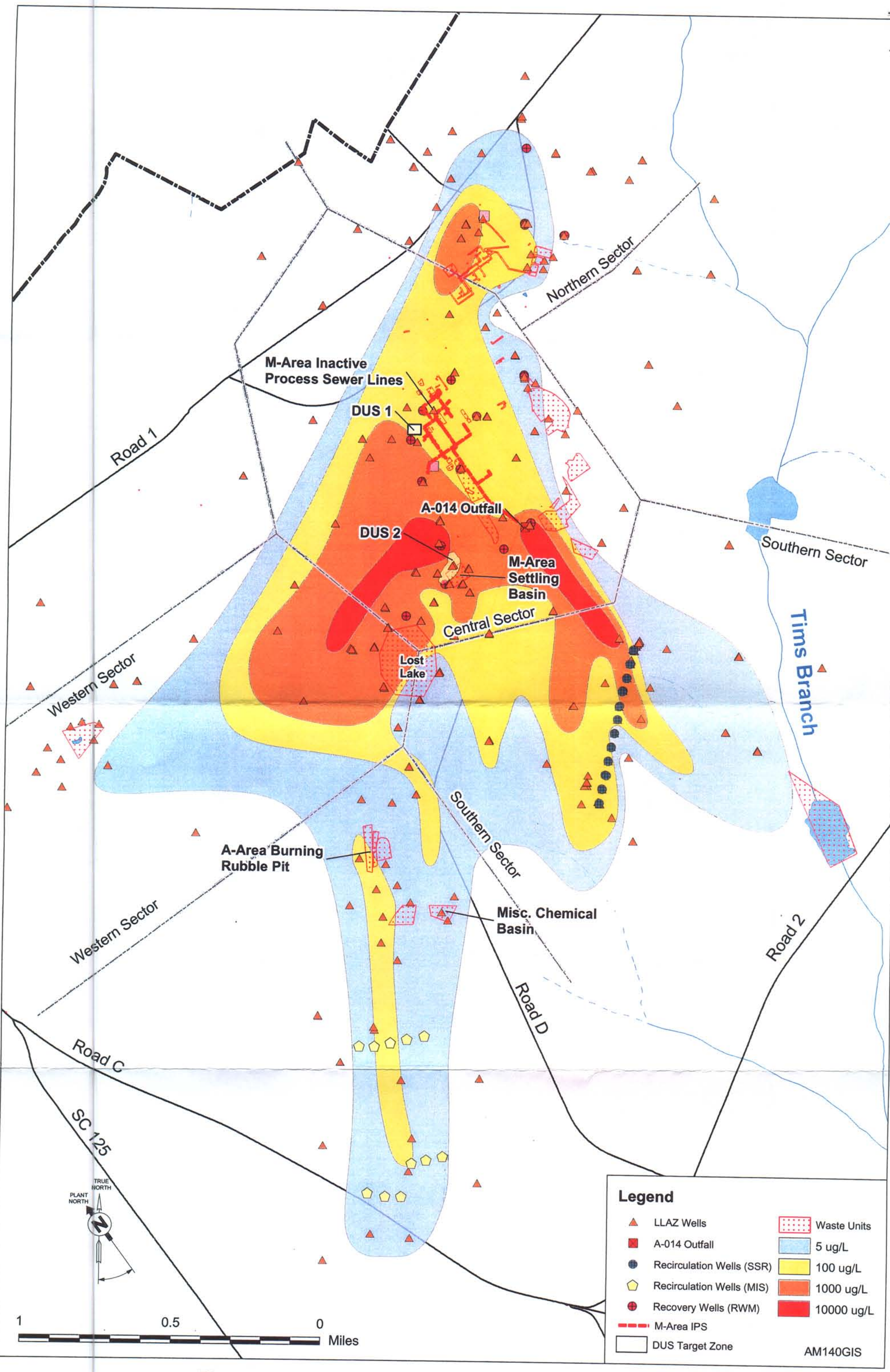

Figure 6 - A/M Area Composite LLAZ TCE Plume

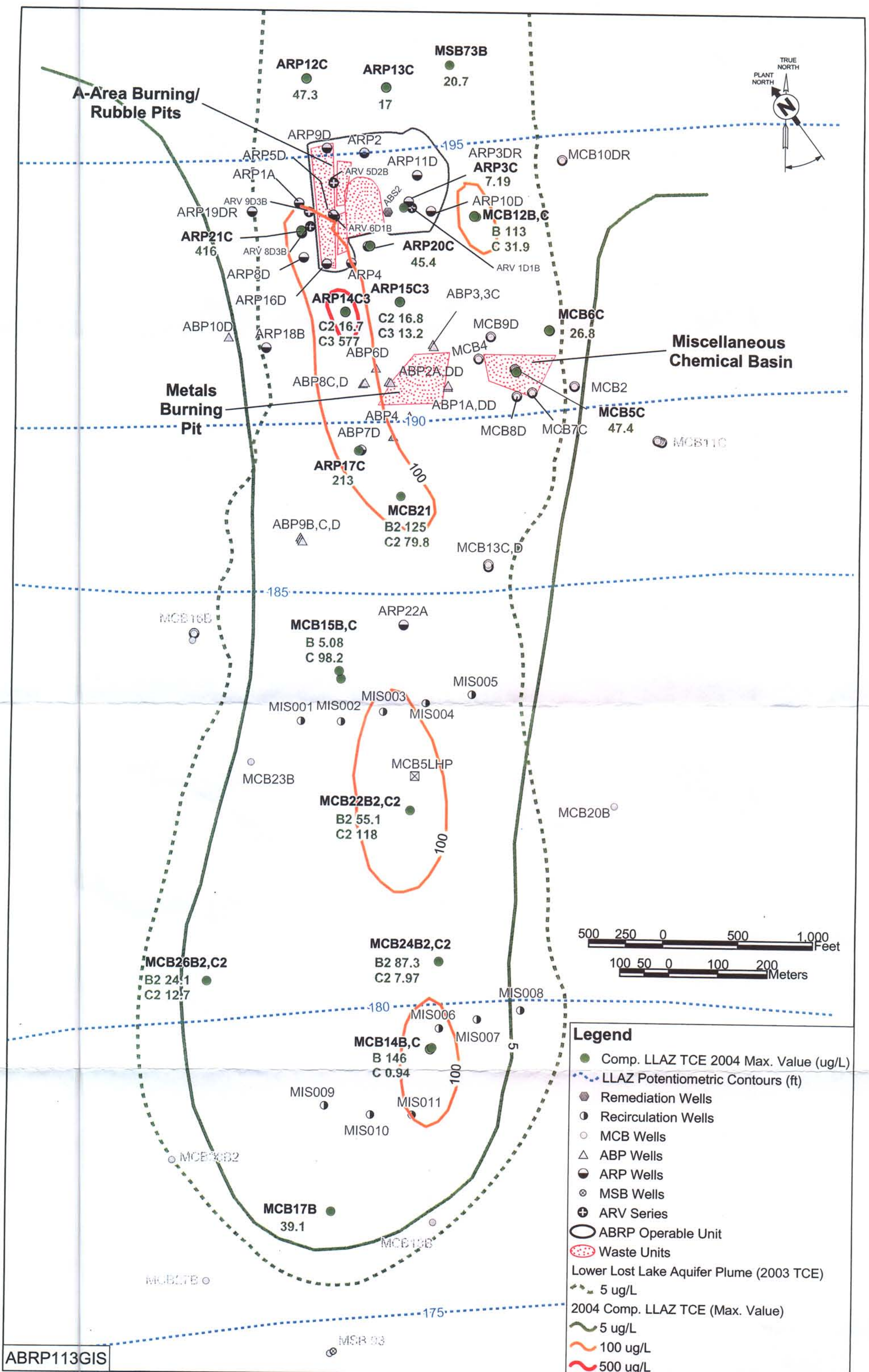

Figure 7 - 2004 TCE Plume in LLAZ

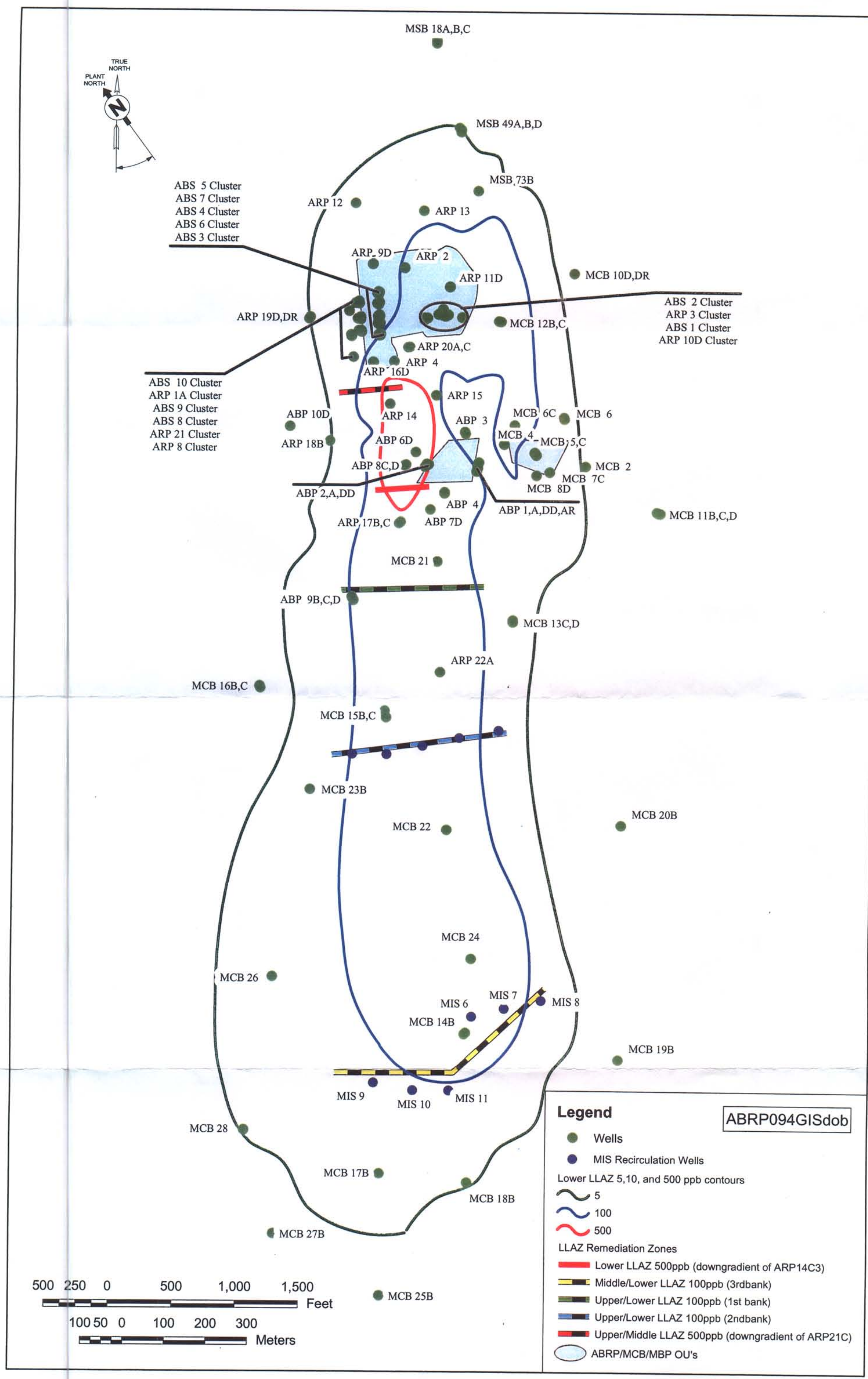

Figure 8 - LLAZ Remediation Lines Evaluated in CMS/FS